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Arnold Schwarzenegger
Governor

INTEROFFICE MEMORANDUM

TO: Tim Regan
Staff Counsel

FROM: Roger W. Briggs
Executive Officer

DATE: September 20, 2004

RE: SWRCB/OCC FILE Nos. A-1654 and A-1654(a): FORMER OLIN AND STANDARD FUSEE CORPORATION FLAIR MANUFACTURING FACILITY, 425 TENNANT AVENUE, MORGAN HILL: RESPONSE TO PETITION REGARDING CLEANUP OR ABATEMENT ORDER No. R3-2004-0101

This memorandum responds to the petitions submitted to the State Water Resources Control Board (hereafter "State Board") by Olin Corporation and Standard Fusee Corporation (hereafter "Discharger" when referred to collectively) regarding the Central Coast Regional Water Quality Control Board's issuance of Cleanup or Abatement Order No. R3-2004-0101 on July 6, 2004.[1]

I. Introduction

The former Olin Corporation site is a 13-acre parcel located in southern Morgan Hill. Olin manufactured signal flares at the facility for about 32 years from 1956 to 1988. Standard Fusee leased the site and manufactured signal flares for seven years from 1988 to 1995. Potassium perchlorate was used in the manufacture of flares by both Olin and Standard Fusee from 1956 to 1995.

Perchlorate was first detected at 21 and 55 µg/L in water samples at the site in August 2000 during a due diligence investigation by a potential buyer. By February 2001, Olin made initial contact with Regional Water Quality Control Board (hereafter "Regional Board") staff regarding the perchlorate contamination. Regional Board staff ordered Olin to submit previous investigation reports for the site and required additional testing of the onsite monitoring wells and the City of Morgan Hill Tennant Avenue well.

In March 2002, Olin conducted a soil and groundwater investigation to assess the source and extent of perchlorate, lead, and chromium. Results of the investigation indicated that lead was not a chemical of concern and additional investigation indicated that chromium

[1] The order is incorrectly numbered *R4*-2004-0101.

and hexavalent chromium were not constituents of concern. By October 2002, Olin had completed the Phase 2 soil and groundwater investigation to further determine the extent of perchlorate contamination and fill data gaps and the sampling of downgradient offsite domestic wells (Tier 1 wells) within one half mile of the site. Perchlorate was detected in four wells at concentrations ranging from 9.5 to 98.4 µg/L. The Regional Board ordered Olin to immediately expand the sampling area to include domestic wells located between one-half mile and one mile of the Olin site.

As a result of these and additional investigations, it is now known that the plume extends approximately nine miles downgradient. The Discharger currently believes it has delineated the plume's lateral and vertical extent and has submitted a long-term monitoring plan. Concentrations range from non-detect to 100 ppb, depending on location. The highest concentrations are typically observed within one-mile downgradient. The Discharger has delineated onsite perchlorate, and has started onsite soil and groundwater remediation. Regional Board staff is currently reviewing the Discharger's offsite monitoring recommendations. Regional Board staff will be directing the Discharger to move forward with offsite remediation plans after approving and incorporating the Discharger's offsite monitoring recommendations in their monitoring and reporting program. Regional Board staff anticipates restoration of well use to take many years, if not decades, especially in high concentration areas. This assumption is based on the mass of groundwater that is currently impacted.

Cleanup or Abatement Order R3-2004-0101, issued July 6, 2004, directs Olin Corporation (Olin) and Standard Fusee Corporation (hereafter collectively referred to as "Discharger") to supply uninterrupted replacement water to well owners with perchlorate-contaminated wells. The Order requires the Discharger to provide interim and long term uninterrupted replacement water supply to well owners whose wells meet two important criteria. The first criterion is for wells that test at or higher than 4 parts per billion (ppb). Well owners with wells that test at or higher than 4 ppb shall be supplied interim or long term uninterrupted water service. The second criterion is for wells where perchlorate is detected but that test less than 4 ppb. For those wells, the Discharger shall provide interim uninterrupted water supply, but may cease supply, with Executive Officer concurrence, if after four quarters of testing the results remain less than 4 ppb. In each instance, the Order requires additional testing to monitor perchlorate groundwater concentrations for a three-year period. The Order also requires Discharger to provide long-term replacement water supply for wells with perchlorate concentrations above 10 ppb and submit and submit a detailed work plan and schedule for wells that test between 4 and 9.9 ppb.

Regional Board staff first directed the Discharger to provide interim alternative water in a letter dated October 18, 2002. At that time, the Department of Health Services action level was 4 ppb. The 4 ppb action level was relied upon as the standard for interim replacement water supply (see Declaration of Randolph C. Visser, Exhibit E). At that time, Olin was already supplying bottled water to well owners with perchlorate concentrations above the 4 ppb action level and the offsite contamination was only known to occur one half-mile downgradient. In a letter from Olin dated June 13, 2002 (this letter is misdated; it reads 2002, but was received on June 13, 2003 [via email]),

Olin confirmed that it would supply alternative water either through bottled water or wellhead treatment to below the 4 ppb DHS actions level. Olin would also provide bottled water to well owners with perchlorate results between 2 and 4 ppb, unless and until, there were four consecutive quarters of less than 4 ppb test results. Thereafter, bottled water would no longer be provided. Lastly, Olin agreed to discuss with Regional Board staff alternative water supply for owners who do not fit these criteria (see Declaration of Randolph C. Visser, Exhibit G).

On April 7, 2004, Olin requested that Regional Board staff confirm that bottled water could be provided at the recently changed Department of Health Services action level of 6 ppb, which in turn was based on the Public Health Goal (PHG) that the Office of Emergency Health Hazard Assessment (OEHHA) set earlier this year. Regional Board staff evaluated Olin's request and issued a letter dated April 29, 2004 that rejected Olin's requests. Regional Board staff based this decision on 1) Resolution No. 92-49, 2) recent amendments to Water Code Section 13304 (amended by Senate Bill 1004) 3) groundwater quality data showing perchlorate fluctuations in wells that may be related to seasonal changes in groundwater elevation and quality, 4) potential laboratory error rates (see Declaration of Randolph C. Visser, Exhibit C), and 5) the uncertainty within the scientific community regarding safe levels of perchlorate. These rationale are discussed in greater detail below. Regional Board staff expressed concerns that laboratory error rates (15% error rate, depending on sample dilution requirements)[2] may potentially expose drinking water users to levels of perchlorate at 6 ppb or above, when test results indicated that the concentrations are below that level. On May 27, 2004, Olin petitioned to the State Board on the premise that the Water Code Section 13267 Order requiring alternative water supply was invalid. Subsequently, the State Board responded to Olin's petition, stating that Regional Board staff's letter was not a final action.

On July 6, 2004, the Regional Board's Executive Officer issued CAO R3-2004-0101 ("Order" or "CAO") directing Olin the Discharger to provide interim and long-term uninterrupted water supply to well owners with perchlorate concentrations at 4 ppb and higher (described above).

II. Contentions and Responses[3]

Contention 1: Discharger contends that there is no basis to use a standard lower than the Public Health Goal as a trigger for replacement water.

Regional Board Response:

Regional Board staff disagrees that there is no basis for requiring replacement water at 4 ppb. While there are some correctible errors in the findings (discussed below) of the CAO, the conservative levels in the CAO are justified by the inconclusive nature of monitoring data at the site, scientific uncertainty and applicable State Board policy.

[2] This laboratory error is shown on laboratory data QA/QC sheets contained in site monitoring reports.
[3] References to #:# refer to page:line.

A. Regional Board staff appropriately considered available scientific information, both draft and final, and concluded that conservative replacement water triggers are necessary.

The CAO R3-2004-0101 directive is based, in part, on perchlorate-related information from the United States Environmental Protection Agency (USEPA) and the State of Massachusetts. Regional Board staff acknowledges that the CAO incorrectly states that the USEPA and State of Massachusetts have set public health goal (PHG) equivalent perchlorate numbers. The USEPA and State of Massachusetts have issued Draft Toxicological Health Assessments for Perchlorate. PHG equivalent numbers have not been finalized by either agency, the Reference Dose is not equivalent to a PHG and the draft documents do not represent final agency action. However, Massachusetts has issued interim guidance advising members of sensitive groups not to consume drinking water containing more than 1 ppb perchlorate for more than three or four weeks.[4]

Although the two health assessment documents are drafts, they are an important indicator of the lack of scientific consensus about what is a safe level for consumption of perchlorate, particularly for sensitive receptors. USEPA addressed this uncertainty in its Perchlorate Questions and Answers Document (Visser Declaration, Exhibit P.) This document states that the range of uncertainty for a "safe" level spans from 1.3 ppb to 54 ppb. (Id., p. 2.) Olin's statement that USEPA generally considers 4-18 ppb a "safe" level is incorrect and contrary to the explicit language of the document, which states that the purpose of the assessment guidance is to provide toxicological factors to be used in the risk assessment and *not* to suggest or prescribe what levels of perchlorate ought to be considered safe. (Id., p. 4.)[5] OEHHA also recognized this level of uncertainty. The *Public Health Goals for Chemicals in Drinking Water: Perchlorate* (March 2004) ("Perchlorate Report", Visser Decl., Exhibit M) recognizes that OEHHA may have to revise the PHG when more information becomes available. (Perchlorate Report at p. iv.)

As stated in the CAO, there is general agreement in the scientific community that the most sensitive receptor populations are pregnant women, infants, developing children, and hypothyroid individuals. (See Declaration of Randolph C. Visser Exhibits M, S, T and Appendix to Olin Corporation's Petition Exhibit A and B). California, and the Massachusetts, and USEPA drafts all utilize an uncertainty factor to account for the lack of conclusive data on perchlorate's impact on sensitive receptors when calculating a PHG or its equivalent number. There is a difference between the OEHHA uncertainty factor and those used in the Massachusetts and USEPA drafts. The Massachusetts Draft Toxicological Health Assessment utilizes larger uncertainty factors that range from 30 to

[4] Spring 2004 Standards and Guidelines for Contaminants in Massachusetts Drinking Water, p. 14 n.1 (available at http://www.mass.gov/dep/brp/dws/files/dwstand.pdf); Massachusetts Department of Environmental Protection, Perchlorate Q&A (http://www.mass.gov/dep/ors/files/pchlorqa.pdf, accessed on Sept. 18, 2004). The Regional Board requests the State Board to take administrative notice of these documents.

[5] The document states that, for purposes of setting cleanup goals, levels between 4-18 ppb are "protective" of sensitive populations, depending on other site-specific criteria, including the presence of other pollutants that act synergistically with perchlorate. Nitrate may be one such constituent. (Perchlorate Report at p. 85.)

300, which the authors believe assure protection of the most sensitive populations. If the Massachusetts draft reference dose were used to calculate a PHG equivalent number, it would be 1 ppb. The USEPA's draft also uses a 300 uncertainty factor and recommends a reference dose that would yield a PHG equivalent number of 1 ppb. OEHHA used 10 as the safety factor.

The OEHHA Perchlorate Report notes that USEPA's draft perchlorate risk assessment applies an overall uncertainty factor of 300 to calculate a draft oral reference dose. The PHG is based on a single human study reported by Greer *et al.* (2002). (Perchlorate Report at 1.) The study lasted only fourteen days and included only 37 subjects, none of whom were pregnant women, infants or individuals with thyroid problems. (Perchlorate Report at 1-2.) The most catastrophic reported impact of iodine deficiency (which perchlorate can cause by impairing thyroid function) is cretinism, an irreversible defect in infants. (Perchlorate Report at 3, 7, 18.) Some data suggest that thyroid hormone levels are most likely to be affected by relatively recent perchlorate exposure (1-3 months). (Perchlorate Report at 49-50.) As discussed below, monitoring data and other information suggest that perchlorate levels in domestic wells fluctuate, and that sample results below 4.0 ppb do not rule out the presence of higher levels of perchlorate at other times of the year. This uncertainty supports the Regional Board's cautious approach, particularly in light of the relatively low cost of replacement water.

It is absolutely necessary to be cautious when considering these differences in uncertainty factors and methods. As noted in OEHHA's public health goal report, "*developing fetuses and neonates are considered particularly sensitive to iodine deficiency because of the irreversible changes that can occur during this period of rapid structural and behavior development. Severe iodine deficiency (25 ug/l/day) during pregnancy can cause prenatal death and cretinism (WHO, 1994; as cited in Hollowell et al., 1998).*"

In response to uncertainties surrounding the USEPA's draft health risk assessment, the USEPA, in cooperation with several federal agencies have referred several important health risk assessment questions to the National Academy of Sciences for Review and Guidance before issuing a Final PHG equivalent number. The USEPA and the states of Massachusetts and California are awaiting the National Academy of Science's (NAS) final recommendations and each has pledged to consider the NAS findings in establishing their PHG equivalent number or, in the case of California, reconsider it's PHG and make appropriate changes based on NAS findings. Notwithstanding the errors contained in CAO Finding 10, paragraph 2, the CAO, establishing the alternative water supply level at 4 ppb is appropriately conservative (cautious) considering the uncertainties surrounding safe levels of perchlorate and the irreversible effects noted above. In order to correct Finding 10, we suggest that the State Board make the following changes to that finding:

> Second, there is significant disagreement in the scientific community regarding safe levels of perchlorate consumption. A perchlorate Public Health Goals~~, also called Reference Dose by some government agencies (hereafter referred to collectively as "public health goal")~~, ~~have~~ has been established by ~~both~~ the California Office of Environmental Health Hazard

Assessment (OEHHA) ~~and the state of Massachusetts Department of Environmental Protection~~. Other states have issued interim guidance or set action levels between 1 ppb and 18 ppb. The United States Environmental Protection Agency (USEPA) has recommended risk assessment for clean-ups consider a range between 4 ppb and 18 pbb.~~also established a perchlorate public health goal~~. Both USEPA and Massachusetts have issued draft toxicological assessments supporting action levels of 1 ppb, although these documents are still being peer-reviewed. ~~The public health goal is used by the respective states and federal government in establishing drinking water standards.~~ There is general agreement ~~among these entities~~ that the most sensitive receptor populations are pregnant women, infants, developing children, and hypothyroidic individuals. ~~While the USEPA's and Massachusetts public health goal is 1 ppb, California's is 6 ppb.~~ Some of t~~T~~he difference between ~~California's and the USEPA and Massachusetts~~ public health goals is based on the uncertainty factor used. ~~The USEPA and Massachusetts public health goal is calculated using a larger uncertainty factor, which they believe assures protection of the most sensitive populations. The OEHHA level also strives to be protective of sensitive populations, but differs on magnitude. The states of Massachusetts and California are both~~ OEHHA is awaiting the National Academy of Science's (NAS) final recommendations on an acceptable public health goal. ~~Both states have~~ and will ~~pledged to re~~-review ~~their~~ California's public health goal~~s~~, if the NAS study differs from each state's respective goal. Since ~~the states' and USEPA's~~ toxicological risk assessments differ in regard to an appropriate uncertainty factor, public health goal, and because the NAS study is still underway, it is appropriate to continue requiring interim uninterrupted replacement water supply at the conservative levels described below in ordering paragraphs 1 and 2.

The Regional Board acknowledges that the OEHHA and the California Department of Health Services (DHS) are the statutorily designated authorities for assessing chemical exposure risks and establishing drinking water standards in California. As noted above, Regional Board staff believes it is important to consider the USEPA's decision to delay issuance of its final Toxicological Health Assessment (and thus the Maximum Contaminant Level Goal [MCLG] and Maximum Contaminant Level [MCL]) based on the continuing scientific uncertainty. Because of this uncertainty, the USEPA requested that the NAS review science used by the USEPA to produce its draft Toxicological Health Risk Assessment. As previously stated, the states of Massachusetts and California have also pledged to consider the NAS study in its drinking water standard development process and review its PHG, respectively. It is important to note that OEHHA's second PHG peer review resulted in perchlorate PHG estimates that ranged from a low of 2 ppb to as high as 220 ppb. This range of PHG peer review demonstrates the uncertainty regarding safe perchlorate levels throughout the scientific community.

Olin has brought up other state drinking water standards, specifically Nevada's, which is 18 ppb. It should be noted that differences exist between many states in regard to drinking water standards for perchlorate. Action Levels for perchlorate in drinking water have been established for several states as outlined in the following table:

Table 1
Drinking Water Standards*

State	Action Level (ppb)
New York	18‡ and 5†
Texas	4‡, 7†, or 18†
Arizona	14
Massachusetts	1
Maryland	1
New Mexico	1
Nevada	18

* From: Perchlorate in Drinking Water California Public Health Goal document, March 2004 (see Declaration of Randolph C. Visser, Exhibit M, page 155)
† Regional Board staff could not confirm prior to submittal of petition response.
‡ State Action Level according to web site.

As shown, perchlorate drinking water standards vary from state to state. This wide range of numbers from 1 to 18 ppb demonstrates the range of scientific uncertainty related to safe levels of perchlorate in drinking water.

Regional Board staff members attended a perchlorate conference in Glendale, California on August 4, 2004.[6] Gina Solomon, M.D., M.P.H., stressed the need to be cautious when determining safe levels of perchlorate in drinking water. This cautious approach was based on protecting the most sensitive populations since studies of the effects of perchlorate on these groups currently do not exist.

B. The Regional Board afforded appropriate deference to OEHHA and DHS.

The Regional Board recognizes that OEHHA and DHS are the state agencies with authority to set public health goals and maximum contaminant levels for public drinking water supplies. The Regional Board, however, is the state agency with primary authority over water quality in the Central Coast Region. (Wat. Code §13001.) As part of that authority, the Regional Board may require dischargers to abate all effects of their waste. (Wat. Code §13304.) The state and regional boards must attain the highest water quality that is reasonable. (Wat. Code §13300.)

[6] The Regional Board requests to augment the record with this discussion and Dr. Solomon's presentation slides. (23 Cal. Code of Regs. §2050.6. These materials were not part of the record when the Regional Board issued the CAO because they did not exist yet. Information about Dr. Solomon is attached.

Public health goals and maximum contaminant levels are often used as water quality objectives or clean-up goals, or to translate narrative objectives. Thus, the regional boards do defer to OEHHA and DHS. However, the Regional Board is not bound by these levels in setting clean-up goals. Both the anti-degradation policy (State Board Resolution No. 68-16) and Resolution No. 92-49 may require clean-up goals that are more stringent than water quality objectives. In addition, the MCL process only establishes levels that public water purveyors must meet in order to meet license requirements. Allowing purveyors to meet less stringent requirements than complete clean-up makes sense. Purveyors are not the entities responsible for causing the contamination, and must bear the cost of providing an affordable, potable drinking water supply using whatever water supplies are available. In this case, however, Olin and Standard Fusee are not purveyors but dischargers. Requiring them to abate all effects of the waste is within the Regional Board's Section 13304 authority.

This is not a question, as in *Paredes v. County of Fresno* (1988) 203 Cal.App.3d 1, of whether a local entity can impose requirements on a water purveyor that are more stringent than state standards. Under Resolutions No. 92-49 and No. 68-16, the state and regional boards do have authority to require clean-up to levels more stringent than MCLs, even if the only beneficial use is municipal and domestic supply. The same rationale should apply to abatement actions, since it is based on the same authority. The issue of consistent regulation of water *purveyors* is not at issue here.

C. Levels of perchlorate in affected domestic wells cannot be determined with sufficient certainty to rely on the public health goal alone.

Regional Board staff disagrees with the Discharger regarding the relevance of well and seasonal sampling variations. (See MPA at 24-25). Regional Board staff expressed concerns in its April 29, 2004 directive, that laboratory error rates (15% error rate, or higher, depending on sample dilution caused by potential matrix interferences or other testing requirements), may potentially expose drinking water users to levels of perchlorate at six or above, when test results indicated that the concentrations are below that level. This laboratory error is shown on laboratory quality control data sheets contained in site monitoring reports. Regional Board staff believes that variations in downgradient groundwater quality results, and the uncertainty related to safe levels of perchlorate in drinking water, necessitate a conservative approach to alternative water supply. Groundwater quality variations have been observed in offsite wells that are located throughout the affected area. According to the Dischargers' data, nearly 40 wells have had detections that fluctuate between non-detect (at 4 ppb) to 6 ppb. (See Administrative Record, First Quarter 2004 Groundwater Monitoring Report, Tables 1 through 5). These wells are located throughout the affected area (up to six miles from the former flare manufacturing facility) and generally down the axis of the valley.

It is currently unknown why these wells exhibit fluctuating perchlorate concentrations. (Offsite seasonal variations in groundwater data are discussed below). Staff believes that these changes in concentrations may be related to a number of issues including changes

in groundwater elevations, groundwater recharge, well depth, screened interval, pump elevation, and pumping rates. Additionally, the perchlorate plume is located in a seismically active area and it has been established that earthquakes can cause significant and sudden changes in groundwater elevations, flow paths, and concentrations of contaminants in wells. Given the number of wells that have fluctuated above and below 6 ppb, it is appropriate to require replacement water at 4 ppb since the possibility exists that the perchlorate concentration could rise to or above 6 ppb throughout the year. This is reasonable since Regional Boards require wastewater treatment plants to test discharges to surface waters on a daily basis and sometimes on a continuous basis to protect fish. With this perchlorate site, the receptors are humans who continuously use the water. Yet monitoring cannot be continuous, nor daily, nor even monthly. Considering the inability (logistics) to monitor sufficiently in light of the threat, a conservative approach to supplying clean water (which is not logistically limited) is not only warranted, but absolutely appropriate.

Regional Board staff has reevaluated Olin's groundwater monitoring data to determine if seasonal variations related to groundwater quality can be discerned. Regional Board staff believes that there is not enough data to determine if season variations in perchlorate concentrations occur. This lack of data is related to a limited number of groundwater quality sample results for each individual well and especially the lack of well specific groundwater elevations. Regional Board staff has requested offsite groundwater elevation data for individual wells (See Administrative Record, Revised MRP 2001-0161). The Discharger has not supplied that information. Olin has submitted regional groundwater elevation maps that were prepared by the Santa Clara Valley Water District and those maps show wet and dry season variations in regional groundwater elevations that range from 10 to 30 feet or more. Groundwater quality variations related to elevation changes appear to exist in downgradient site boundary wells and two offsite wells (0903E34C003 and 0903E34C002) in the intermediate aquifer that have a minimally sufficient number of groundwater quality data points. While these data do not represent the entire affected area, the data do indicate that seasonal variations may occur farther downgradient. These data are included in Olin's *First Quarter 2004 Groundwater Monitoring Report, Olin/Standard Fusee Site, Morgan Hill California* and are included in the administrative record. As stated above, the reported variations in individual well perchlorate concentrations and lack of well-specific groundwater elevation data and sampling results require a conservative approach to alternative water supply. A 2 ppb range provides a reasonable factor of safety based on the fluctuating perchlorate quality levels observed in offsite wells. As discussed in Section B, the 6 ppb perchlorate action level was not established as a water replacement standard. Notwithstanding the drafting error contained in Finding 10, paragraph 3, the conservative approach to alternative water supply is warranted based on fluctuating levels of perchlorate in downgradient wells alone.

We request the State Board to modify this finding by striking "and quality" from the first sentence, deleting the word "seasonal" from the third sentence (since the fluctuations may be caused by something other than seasonal variability), and adding the following

sentence: "Additionally, downgradient perchlorate concentrations vary from non-detect to over 6 ppb throughout the affected area."

Olin also contends that OEHHA's uncertainty factor (referred to by Olin as a "tenfold safety factor") would protect against any seasonal variables suggested by the Regional Board. The uncertainty factor was included in the PHG to protect the most sensitive populations from exposure to perchlorate based on the uncertainty in the data regarding safe consumption levels, not on the difficulty of interpreting lab results or the possibility that a person might consume water containing higher levels than testing data shows. A discussion of the uncertainty factor and its use is located on page 85 of OEHHA's Perchlorate Report. As discussed previously, perchlorate concentrations are shown to fluctuate throughout the affected area. The uncertainty factor does not take into account fluctuating perchlorate concentrations in wells or a laboratory margin of error. As discussed earlier, perchlorate concentrations have and do fluctuate in the affected area and these sensitive populations could still be exposed to perchlorate concentration over 6 ppb. Therefore, Regional Board staff believes a lower standard for replacement water is necessary based on the range of sampling result variations seen throughout the affected area.

D. The Regional Board has not relied on a "yet to be determined" cleanup goal to justify replacement water requirements. [See MPA at 10-11.]

Alternative water would not be required if the perchlorate had not been discharged. While some wells are below 6 ppb, perchlorate is not a naturally occurring (background) constituent of local groundwater. The natural background perchlorate concentration in the Llagas groundwater sub-basin and vicinity is zero. Since the perchlorate discharge has caused a condition of pollution or nuisance and has impacted groundwater beneficial uses, Olin is required to abate potential and actual effects. State Water Resources Control Board Resolution No. 92-49 applies to all cleanup and abatement activities, including providing alternate water supplies. Section 13304 provides authority to require complete cleanup and restoration of all affected water to background levels. (Resolution No.92-49, Finding 4.) The Resolution requires dischargers to "clean up *and abate* the effects of discharges in a manner that promotes attainment of either background water quality, or the best water quality which is reasonable if background levels of water quality cannot be restored, considering all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible." (Id., Section III.G.) Therefore, unless a discharger can demonstrate that it is infeasible, *all* effects of the discharge must be abated so all affected users of the water are entitled to a supply of drinking water that is non-detect for perchlorate. In this case, the only basis for a finding of infeasibility is the expense of replacement water, which is not significant.

The only mention of replacement water requirements in Resolution No. 92-49 is in the containment zone provisions. A containment plan must provide, if appropriate, for "equivalent alternative water supplies, reimbursement for increased water treatment costs to affected users, and increased costs associated with well modifications" (Id., Section

III.H.2.e). In other words, when contamination remains in place, the discharger must either provide affected water users with replacement water that is equivalent to the water they had before the discharge occurred or pay for increased treatment costs. Here, contamination will only remain in place until clean-up is complete, but this provision of the containment zone policy is important absent any other State Board guidance. There is no reason why water users affected by a discharge that will not be cleaned up for some period of years should receive lesser treatment than those affected by a containment zone.

Recent amendments to Water Code Section 13304 support this interpretation. (Senate Bill 1004). That section now requires replacement water to "have comparable quality to that pumped by the public water system or private well owner prior to the discharge of waste." (Wat. Code §13304, subd. (f).) Olin argues that this language addresses what the replacement water quality must be, but not who is entitled to get it. This oversimplifies the issue. If replacement water is required only at or above a PHG or MCL, this would lead to the untenable situation in which some well-owners must receive water that is non-detect for perchlorate (the quality pumped prior to the discharge), while neighbors with wells testing at 5.9 ppb would receive no replacement water or treatment at all. It makes no sense that replacement water of background quality is required, but only if the well is more polluted than the public health goal.

In enacting SB 1004, the Legislature considered an amendment that would have narrowed replacement water requirements so that replacement water would only have to meet the following standard: "drinking water deemed suitable by the Department of Health Services (DHS), treated with the best available treatment technology, or if the best available treatment technology does not exist for the contaminant, water treated in a technologically and economically feasible manner based on the action level established by DHS."[7] This language would have been more consistent with the Discharger's proposed approach. All affected well owners would then have similar water supplies whether they received replacement water or pumped their untreated wells. The Legislature's rejection of the proposed amendment suggests that the Legislature did not consider DHS levels to be the appropriate yardstick for replacement water plans, either for determining who should receive it *or* for determining how clean it should be.

The Discharger has not demonstrated technical or economic feasibility, either for bottled water or long-term replacement water. The Dischargers own report (MACTEC, April 2004) demonstrates that long-term replacement would be technically feasible. No technical constraints apply to providing bottled water.

The Discharger has not demonstrated economic infeasibility either. Although the Declaration of Richard W. McClure includes cost information, by its own estimation the discharge has impacted 970 private wells. (McClure Decl., p. 5) Several municipal supply wells have also been impacted, although they are not at issue in the CAO. The Declaration does not include any supporting documentation, indicate what the "replacement water" costs include (e.g., monitoring costs) or explain whether cheaper

[7] See Assembly Committee Analysis for July 8, 2003 hearing on SB 922 (the predecessor to SB 1004), at http://www.leginfo.ca.gov/pub/bill/sen/sb_0901-0950/sb_922_cfa_20030707_134529_asm_comm.html.

alternatives are available. Neither Standard Fusee nor Olin has demonstrated any inability to pay. Olin's own website states that it had $1.6 billion in sales last year.[8] The website of Orion (Standard Fusee's business name) states that Orion is the largest manufacturer of emergency flares in the world.[9] The Discharger has the ability to reduce its replacement water costs by accelerating the cleanup schedule. The relatively low annual costs of providing replacement water do not justify an economic infeasibility finding in this case.

E. The replacement water requirements are not inconsistent with cleanup goals at other sites and do not violate Resolution No. 92-49's policy favoring consistency in cleaning up similar sites.

The Regional Board objects to introduction of this issue and the supporting evidence, because it was not presented to the Regional Board, and the Petitioners have not satisfied the requirements for augmenting the record. (See 23 Cal. Code of Regs. §§2050(a)(9), 2050.6, 2064.) The Discharger had the opportunity to present evidence and argument to Regional Board staff during the lengthy process of drafting the Order. Staff advised the Regional Board about this issue during staff reports at the May 14, 2004 board meeting. The meeting notice, which Dischargers received, included a discussion of this issue. (See, Staff Report for May 14, 2004 meeting.) In addition, the Regional Board offered to hold an evidentiary hearing (see July 6, 2004 letter from Roger Briggs transmitting the CAO) but the Discharger declined. In the event the State Board considers this new argument and evidence, the Regional Board provides the following response.

Resolution No. 92-49 includes a policy requiring regional boards to act consistently with respect to similar clean-ups. Of the two other cleanups cited by the Discharger, one (the United Technologies Corporation site) actually establishes a cleanup level of non-detect. The other is a gasoline site, and is not analogous.

The San Francisco Bay Regional Water Quality Control Board issued Final Site Cleanup Requirements, Order No. R2-2004-0032 to United Technologies Corporation (UTC) that establishes an onsite groundwater cleanup level of 6 ppb (see Olin Corporation's Request for Stay, Exhibit F). The order prohibits the discharge of detectible quantities of perchlorate in surface water or stream under flow that is leaving the site. Both groundwater and surface water off-site must be non-detect for perchlorate, using a 4 ppb detection limit. Dr. Keith Roberson (phone conversation on September 16, 2004, between David Athey and Dr. Roberson) the UTC Site Cleanup Order author, confirmed that the San Francisco Bay Regional Water Quality Control Board considers the offsite cleanup level to be non-detect (at 4 ppb) based on the perchlorate discharge prohibition. According to Mr. Roberson, this prohibition was included to protect Anderson Reservoir, a drinking water source. Other Regional Boards have established cleanup levels below 6 ppb, including Region 5 at the Aerojet facility (4 ppb), issued in response to USEPA's Record of Decision (see September 2002 Cleanup and Abatement Order R5-2002-0723)

[8] http://www.olin.com/about/default.asp
[9] http://www.orionsignals.com/About_Us/index.html

and in Region 3 at Vandenburg Air Force Base (4 ppb) (see May 8, 2003 Letter to Ms. Beatrice L. Kephart).[10]

The *Spencer Rental Service* order was issued in 1987, five years before the State Board adopted Resolution No. 92-49. The current requirement to achieve background levels was not a factor in that decision. Moreover, the order involved cleanup levels, not replacement water, and the waste in that order was gasoline and diesel. These products naturally attenuate.[11] The plume in *Spencer Rental Service* was small and had not migrated to a monitoring well only 80 feet away. The State Board's order does not discuss any current use of the groundwater in question. The cleanup in *Spencer Rental Service* was not analogous to this site. Unlike BTEX and diesel, perchlorate is extremely mobile and can persist for many decades. (Perchlorate Report, page 11; EPA, *Perchlorate Environmental Contamination: Toxicological Review and Risk Characterization* [Draft document] (2002), p. E-1.) The groundwater is currently being used and the pollution is currently impacting well users throughout a nine-mile plume. Even if the Regional Board were setting *cleanup* levels for Olin, the Spencer Rental site is not analogous enough to invoke the policy favoring consistent enforcement.

F. The Regional Board staff's use of a replacement water trigger different than California's perchlorate PHG and action level is appropriate and consistent with staff's prior actions.

As is often the case in cleanup projects, Regional Board staff has changed course or decisions based on new information. Early in the investigation, Olin agreed with Regional Board staff to supply bottled water to wells owners with perchlorate concentrations that exceeded 4 ppb. In January 2002, the DHS lowered the action level of perchlorate from 18 to 4 µg/L in response to the release of the USEPA External Draft Review Reference Dose for perchlorate of 0.00003 mg/kg/day. That translated into a drinking water concentration of approximately 1 µg/L. The agreement to supply bottled water was outlined in an October 18, 2002 directive to Olin. In that letter (see Declaration of Randolph C. Visser, Exhibit E), Regional Board staff states the concern regarding detections of perchlorate above the action level. The directive also outlined Regional Board staff concerns regarding perchlorate potential effects on newborns and pregnant mothers and their unborn children. As is stated in Perchlorate Report, these effects can be catastrophic and irreversible. At that time, the reporting limit was 4 ppb and detections below that level could only confirm that perchlorate is present but could not quantify the amount.[12] Regional Board staff believed at the time that the then-current action level would be sufficiently conservative since reliable analytical results below 4 ppb were not available.

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[10] If the State Board considers the Dischargers' consistency argument and evidence, the Regional Board requests to supplement the record in order to respond to this new argument. The supplemental evidence consists of the discussion of the telephone call with Dr. Roberson and the Aerojet and Vandenburg materials.

[11] The State Board did not discuss this factor in the Order.

[12] This is still the case under USEPA Method 314.0, although modifications are pending that would reduce the quantification level (and increase monitoring costs) significantly.

However, as the investigation into the extent of Olin's contamination grew, so did staff's concerns regarding fluctuations of perchlorate concentrations and the possibility that they may fluctuate. In June 2003, Regional Board staff met with Olin to discuss perchlorate concentrations in wells that were testing in the trace range (typically between 2 and 4 ppb). Regional Board staff was concerned, then as now, that these wells could test at trace levels but actually be above the action level. Olin agreed to supply bottled water to those well owners until there were at least four quarters of clean samples, as confirmed in a June 13, 2003 letter (incorrectly dated June 13, 2002) to Mr. Harvey Packard (see Declaration of Randolph C. Visser, Exhibit G). In addition, Olin wrote, "Olin agrees to discuss with Regional Board staff on a case-by-case basis the provision of alternative water to the owners of a limited number of wells that do not fit the above criteria," i.e., wells testing below 2 ppb or wells testing between 2 and 4 ppb with four quarters of clean samples. Regional Board staff was concerned with detections below the current action levels and acted, then as now, in a cautious, conservative manner regarding alternative water supply in requiring Olin to supply bottled water below the then current action level of 4 ppb.

On December 16, 2003, Regional Board staff met with Olin to discuss long-term alternative water supply options for perchlorate-affected wells. During that meeting, Olin agreed to develop options for wells that have concentrations from 4 ppb to above 40 ppb. Olin also agreed to supply greater detail for wells starting at 18 ppb, based on the probability that the MCL would be established no higher than that level.

Following establishment of the PHG and action level at 6 ppb, Regional Board staff sent Olin a letter asking for greater detail starting at 6 ppb. Regional Board staff did not direct in that letter or in subsequent conversations, nor do Regional Board files contain any indication that wells below the 6 ppb PHG could be omitted. The CAO reflects this position in that it requires Olin to submit a detailed water replacement plan for wells testing between 4 and 10 ppb. Indeed, Olin's Alternative Water Supply report only provided detail for wells testing at 10 ppb and above, which staff viewed as inadequate in light of the PHG.

Other actions, contrary to Olin's argument, do not corroborate the assertions that the Regional Board "always intended the prevailing PHG/Action Level to govern as the replacement water standard". Olin contends that the Regional Board's enrollment of treated groundwater discharge in the low threat Waiver of Waste Discharge Requirements, Resolution No. R3-2002-0115 supports this claim. Regional Board staff enrolled Olin in the waiver on December 13, 2002, so that Olin could discharge treated groundwater to the City of Morgan Hill's Butterfield Retention Basin. Based on the Dischargers' Report of Waste Discharge, Regional Board staff enrolled Olin in the general waiver. Staff did not deem it necessary to require more stringent effluent requirements because, at that time, the action level was as low as the Reporting Limit (4 ppb) for perchlorate and Olin's Report of Waste Discharge indicated that the system would consistently reduce perchlorate to non-detect levels (see Administrative Record, Non-NPDES Application Form and Annual Fee, Table 1). In addition, the groundwater immediately downgradient of the Olin site and Butterfield Retention Basin contains the

highest concentrations of perchlorate (as high as 100 ppb). Based on those concentrations, even if Olin consistently discharged at 6 ppb, groundwater quality would improve. The system is set up to have confirmation sampling of the influent, midpoint and effluent. As Olin outlines in its Report of Waste Discharge and Treatment System Design report, the lead ion exchange tank will be switched out once breakthrough has been observed. At such a time the lag tank (which is still non-detect at the effluent port) will be switched to the lead position. Utilization of this configuration means that discharge of perchlorate above non-detect is virtually eliminated. Finally, this discharge is necessary to allow operation of the treatment system, and policy considerations supporting the discharge do not apply in determining replacement water triggers (or even final clean-up goals).

Other actions by the Regional Board discount Olin's contention that "Such Regional Board actions further support and corroborate that the Regional Board intended the standard for requiring Olin to provide replacement water to be the prevailing Action Level, and that if the Action Level changed, the standard for alternative water was intended to and required to change also." (MPA 28:21-25). In a letter dated, June 10, 2004, Regional Board staff responded to an Olin statement that they may, at a later date, request an increase in the site soil remediation goal of 50 µg/kg based on the recent action level change to 6 ppb. Staff responded:

> *"As we understand, your potential request would be based on the DHS Action Level change from 4 ppb to 6 ppb. While it may appear appropriate to change the remediation goal based on the DHS action level change, we are not inclined to do so. Ideally, the perchlorate soil remediation goal should be reflective of achieving background groundwater conditions, which is 0 ppb and not 4 ppb. However, since the most reasonable achievable detection limit for perchlorate is 4 ppb, staff is using that as its groundwater protection basis. This shall not be construed as a groundwater cleanup level, rather, it should be viewed a basis for moving remediation forward. Therefore, Regional Board staff will only consider approving a lower soil remediation goal at this time, unless the Regional Board approves a groundwater remediation goal higher than 4 ppb."*

As can be discerned above, Regional Board staff has not indicated any intention of relying on the 6 ppb level. On July 6, 2004, Regional Board staff issued CAO R3-2004-0101 directing Olin to provide interim and long term uninterrupted water supply to well owners with perchlorate concentrations at 4 ppb and higher (as described in the introduction). Regional Board staff based their decision not to use the 6 ppb action level based on the recent changes to Water Code Section 13304, uncertainty on safe levels of perchlorate within the scientific community, and fluctuations of perchlorate concentrations in individual wells in the nine-mile plume area. Regional Board staff's approach to bottled water supply has been consistently conservative, cautious, and appropriate given the catastrophic potential health effects of erring in the wrong direction.

G. The CAO is not inconsistent with the Basin Plan.

The Basin Plan does not include provisions on triggers for providing replacement water. Water quality objectives are only one of the factors in setting cleanup and abatement levels, as discussed elsewhere in this memorandum. The Basin Plan states that cleanups will proceed in accordance with Resolution No. 92-49, and incorporates the anti-degradation policy (Basin Plan, Ch. 4, §VI.H; Ch. 5, §I.B.) To the extent Discharger's requested relief is inconsistent with these policies, it is also inconsistent with the Basin Plan.

This is also consistent with the way water quality objectives are applied in establishing effluent and receiving water limits in waste discharge requirements. Where a water quality objective is equal to the MCL, permits may allow discharges at the MCL or, if there is assimilative capacity, above the MCL. However, a discharge cannot degrade receiving water quality unless the state or regional board finds that the discharge will not create pollution or a nuisance,[13] and is consistent with the maximum benefit to the people of the State. Neither finding is possible here. Even if DHS establishes an MCL of 6 ppb or above, the replacement water requirements in the Order will not be inconsistent the Basin Plan.

Contention 2: The Discharger contends that imposing long-term replacement water requirements is unreasonable until the Department of Health Services establishes maximum contaminant levels.

Regional Board response:

As stated previously, the CAO cites the scientific uncertainty related to the safe levels of perchlorate in drinking water. Regional Board staff believes it is appropriate to wait for the NAS results to be released so that the USEPA and OEHHA can review the findings and apply them appropriately. Once the results have been considered and or incorporated, Regional Board staff believes it may be appropriate to review the requirements of Cleanup or Abatement Order R3-2004-0101.

Although long-term replacement water requirements are related to ground water cleanup, it is not appropriate to completely delay long-term replacement until ground water clean-up levels or MCLs are established. Avoiding unnecessary and uncertain delay is especially important for wells where perchlorate concentrations are high enough (10 ppb and greater) to warrant or demand long-term replacement now. There is sufficient uncertainty about the appropriate maximum contaminant level (MCL) that significant delays in MCL establishment are inevitable.

Recognizing there is more uncertainty at the lower perchlorate levels, the CAO directs long-term replacement now where concentrations are 10 ppb or more, and requires a plan

[13] Nuisance may be present even where levels are below water quality objectives if the waste interferes with the free use of property. (Wat. Code §13050, subd. (m).)

and a schedule for long-term replacement water where perchlorate concentrations range from 4-9.9 ppb. The Discharger claims that providing wellhead treatment on wells testing between 4 and 6 ppb will cost $3.6 to $4.1 million. (McClure Declaration at 5.) In approving a proposed schedule, the Regional Board will consider costs of wellhead treatment, perchlorate concentrations in the well and near-by wells, and the likelihood that permanent treatment will be necessary for particular wells. This, however, is not a basis to delay requiring a water replacement plan, which even the Discharger concedes is required by Section 13304.

Staff disagrees with Olin's contention that requiring long-term replacement water is premature. Regional Board staff believes requiring long-term replacement water is prudent based on the likelihood that a final remedial action plan is not likely to be approved for years, the installation of long-term treatment would provide interim remediation of groundwater, and wellhead treatment is not necessarily permanent and could be removed or modified. Regional Board staff is currently evaluating Olin's final recommendations for offsite monitoring and will be providing comments to Olin soon. Once Olin's offsite monitoring system is approved, Regional Board will reiterate its request for Olin to submit plans for remediation of the nine mile plume. Regional Board staff estimates the earliest this could be accomplished would be early to mid 2006. The installation of interim treatment is not uncommon or without precedent in Region 3 or elsewhere in the state. Regional boards often require interim remedial actions to stabilize contaminant plumes and or abate the effects of groundwater contamination.[14] Lastly, once a final site-specific perchlorate cleanup standard has been established Regional Board staff may allow Olin to remove these systems if they conflict with final cleanup methods.

Contention 3: The Discharger contends that the Regional Board failed to proceed as required by Law by not requiring a replacement water plan and not requiring a phased clean-up.

Regional Board response:

A. The Regional Board did request a water replacement plan as required by Section 13304.

Section 13304 requires a water replacement plan if replacement water will be necessary for more than thirty days. (Section 13304, subd. (h).) "A 'water replacement plan' means a plan pursuant to which the discharger will provide replacement water in accordance with a cleanup and abatement order." (Id., subd. (i).) For wells with detections of perchlorate between 4 and 9.9 ppb, the CAO does require a replacement water plan. (Order, p. 10, ¶ 3.) Olin already provided a replacement water plan for wells with higher detections in the April 16 *Alternative Water Supply Evaluation Report* (MACTEC report). The Discharger advised the Regional Board that ion exchange treatment was the preferred method of providing long-term replacement water for these

[14] The Department of Toxics Substances Control and USEPA also require interim removal actions in sites they oversee. CERCLA explicitly defines replacement water as a removal action. (40 USC 9601(23).)

wells if the Department of Health Services approves this technology. If the DHS approves this technology, the CAO requires a schedule for implementation of this technology. (Order, p. 10, ¶ 5.) Otherwise, the Discharger must select another technology and provide a schedule for Executive Officer approval. (Id.) These requirements, combined with the MACTEC report already submitted, meet the requirement for a replacement water plan. Nothing in Section 13304 requires the Regional Board to force the Discharger to duplicate plans or reports prepared prior to issuance of a cleanup and abatement order or to use the term "water replacement plan."

B. The water replacement requirements are appropriate interim abatement actions.

Resolution No. 92-49 contemplates concurrent activities in situations like this in requiring the Regional Board to:

> Consider, where necessary to protect water quality, approval of plans for investigation, or cleanup and abatement, that proceed concurrently rather than sequentially, provided that overall cleanup and abatement goals and objectives are not compromised, under the following conditions:
>
> > a. Emergency situations involving acute pollution or contamination affecting present uses of waters of the state;
> >
> > b. Imminent threat of pollution;
> >
> > c. Protracted investigations resulting in unreasonable delay of cleanup and abatement ...

(Res. 92-49, II.A.2.) The bottled water requirements are not explicitly implicated by this policy, since they are not necessary to protect the quality of the water in the ground. However, providing bottled water is necessary precisely because it is not possible to protect beneficial uses in the short term, and the clean-up will take years. In fact, even Olin concedes that it will not even be able to start on a remedial investigation and feasibility study until early 2006 (MPA p. 12) – and that is if everything goes as planned in the interim.

Unlike the bottled water solution, providing wellhead treatment will provide some remedial benefit to groundwater quality. The requirement to implement long-term water replacement is explicitly within the above language. Due to the lengthy clean-up process and the immediate threat to well users, implementing a solution that relieves well-users of having to rely on bottled water for years is consistent with Resolution No. 92-49. If the ultimate remedy that the Discharger implements makes it unnecessary to continue to operate these systems, they can be dismantled in the future.

In addition, nothing in Section 13304 or Resolution No. 92-49 requires clean-up goals and replacement water triggers to be the same. The cost and reasonableness of the

abatement action must be considered independently of the cleanup goals for soil and groundwater. Factors that make it infeasible to clean up groundwater to non-detect (background) levels are not necessarily implicated in setting replacement water triggers. For example, if reducing the residual pollution levels from a water quality objective to trace levels would cause a ten-fold increase in the cost of groundwater cleanup, this might justify an infeasibility finding when considered together with other relevant factors. That clean-up goal, however, would not relieve the discharger of taking other actions to abate the effects of the discharge. In addition to providing replacement water, such actions might include use restrictions on the property.

The Discharger argues that setting groundwater cleanup levels now is premature. We agree, but the Regional Board did not establish groundwater cleanup levels in the CAO. Nothing in the Order *requires* the wellhead treatment to achieve any groundwater treatment. As the Discharger points out, the Regional Board might ultimately approve groundwater cleanup goals less stringent than background. The infeasibility of 100% groundwater cleanup, however, is irrelevant to the feasibility of ensuring that the water actually used by the well-owners is equivalent to pre-discharge conditions as to perchlorate. The difficulty that Olin cites in achieving complete clean-up (MPA at 12) actually supports the well-head treatment requirement, since such treatment may continue to be necessary even after clean-up is completed.

III. Conclusion

Fluctuating perchlorate test results and limitations on laboratory methodology makes it difficult to pinpoint the levels of perchlorate that are present in any given well. Section 13304 provides regional boards with authority to require interim and long-term replacement water. State Board policy requires cleanup and abatement goals to be non-detect for perchlorate. The scientific community disagrees on what is a safe level of consumption. Ingestion of perchlorate above these levels might cause severe health effects. For all of these reasons, we respectfully request the State Board to uphold Cleanup or Abatement Order R3-2004-0101.

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Gina M. Solomon, M.D., M.P.H., is a specialist in adult internal medicine, preventative medicine, and occupational and environmental medicine. She is a senior scientist in the Health Program of the Natural Defense Council (NRDC) and an Assistant Clinical Professor of Medicine at the University of California at San Fransisco. NRDC is a national non-profit organization with over 500,000 members dedicated to the protection of public health and the environment. Her work had included research on asthma, pesticides, and environmental and occupational threats to reproductive health and child development. Dr. Solomon received her M.D. degree from Yale and underwent her post-graduate training in medicine and public health at Harvard.

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